

Personal Risks and Long Term Health from Overpressure Exposures

Greetings everyone,

We start this new year with continuing research projects to ensure that we understand the risk of overpressure exposures and the corrective actions we can apply to enhance our immediate safety and to protect the long term health of mission essential personnel. Many important tactical explosive breaching – urban detonation related hazards still are still unknown or misunderstood by the majority of the global practitioners. For the last 34 years, education with peer reviewed and proven facts supported by instrumentation remain a priority mission.

We have identified a disturbing and dangerous reality. It is disturbing because there is no safety oversight to prevent proven, dangerous procedures for positioning mission essential personnel. This network is making a difference for individuals devoted to learning and safely applying detonations in urban environments during life saving incidents.

Our 2014 concluded with an opportunity to study the information provided in a scientific paper published by Lawrence Livermore National Laboratory, 3 September 2009, by applying actual detonations in the urban environment. Blast overpressure injuries related to exposures from IED detonations cause a wide variety of damages to the human body. The paper explains the design feature of the current ballistic helmets worn by combat troops and tactical officers potentially increases the damaging effects of overpressure against the brain. These helmets provide efficient protection against ballistic projectiles and impact injuries, but unfortunately, could trap amplified overpressure that may cause damage to the brain.

The LLNL paper explains how they discovered that non-lethal blasts could induce sufficient skull flexure to generate potentially damaging loads in the brain, even without a head impact. The authors show with three-dimensional hydrodynamical simulations that direct action of the blast wave on the head causes skull flexure, producing mechanical loads in brain tissue comparable to those in an injury-inducing impact, even at non-lethal blast pressures as low as 1 bar (14.5 PSI) above ambient.

Depending on the criteria you use to position your entry team, the resulting overpressure may be exposing your personnel to consistent, damaging pressures against the brain. We remain convinced that anyone experiencing “bell ringing” feelings in their head after a detonation means the exposure may have been too excessive. Every time we hear: “you have to suck it up because it is an operation” has always been disappointing because the negligent education sources promoting this dangerous notion are possibly injuring mission essential personnel. Unnecessary repeated exposures could have effects associated with your long-term health. Using available technology to record actual overpressure exposures validates our concern with this dangerous concept of “sucking up” an unnecessary overpressure strike. We have collected actual overpressure values and a distinct pattern is

very clear that inside the helmet, incident overpressure values are higher than any gauge placement position on the body outside the helmet.

Over the years tests have been conducted to determine the overpressure exposures entry personnel experience. Entry personnel performed their protocol for entry team positioning. The researchers were interested in collecting overpressure exposure recordings, not to critique the tactical protocol. Wall charges were detonated on the volunteers' range facility (no reflective surfaces were present that may be present in urban settings). Chest mounted instruments placed on the entry personnel were recording +/- 13 PSI exposures positioned behind a ballistic blanket based on the practice to "half a calculated distance for 4 PSI incident overpressure." These recorded values are not surprising because the "K" equation calculates almost the identical distance for 13 PSI.

Our recent testing is showing a consistent pattern that inside the helmet, overpressure recordings are higher than incident overpressure or diffracted overpressure exposures. Now in hindsight, those volunteer entry personnel involved in the testing may have been unknowingly exposed to higher value damaging pressures against their brains.

NOTE: We are not criticizing these tests, the entities supplying the volunteers or collecting the data. At the time, the importance of increased overpressure exposures inside the helmet was far from being identified as a problem and studied. These test series revealed critical information to refine understanding of risk exposures and preventive measures for users. In fact, these test series concluded with published facts (2011) that the "K" equation was not designed to intended as automatic guidance to determine safe positioning from calculated incident overpressure values. It also concluded that positioning entry personnel at half a calculated 4 PSI incident overpressure distance was not safe and recommended to discontinue this practice.

We recently conducted series of explosive breaching tests (62 detonations) using the **BLACKBOX** BIOMETRICS Blast Gauge (B3 Blast Gauge) and collection software system. The product brochure states: *"Traumatic brain Injury has been recognized as the signature injury of modern day conflicts, yet most war fighters remain without blast exposure logging capabilities. The B3 Blast Gauge provides an immediate solution to capture soldier exposure to explosive blast – guiding triage in the field and exposure tailored medical treatment for TBI."* The system collects an 18 millisecond overpressure time history if the user properly adjusts the gauge setting (more on this later). For each detonation, we placed a gauge as recommended by the manufacture on the helmet's back neck strap area. We had concerns regarding the manufacturer's literature explaining this gauge position will provide a recording useful for field triage personnel to determine overpressure exposure that may show what the brain experienced. Since the manufacturer's product literature states a data collection goal is for potential TBI recognition, our concerns were confirmed that this recommended placement does not provide accurate recording of what actually is exerted against the brain. There is no surprise that this recommended placement does not provide true pressures against the brain, because this position receives a reduced overpressure value compared to the initial overpressure strike.

We are still reviewing the data recorded from the 62 detonations. There was an incredible amount of information collected. Our initial review of the overpressure histories did reveal the patterns we expected:

- Every recorded exposure inside ballistic helmets was at least double or higher than all other gauge placement recordings.
- We used ballistic helmets that enclosed the head and had a vent space between the ballistic shells. There was no significant difference between recordings with the vented helmet compared to the enclosed design. (NOTE: the vented helmet manufacturer does not claim reduction of overpressure exposure using their design. We just wanted to identify if there was a difference.)
- The gauge recording at B3's recommended position was consistently lower.

We have every reason to believe the B3 recording system is quality product. Our collected data agrees with recorded data from other sophisticated overpressure recording instrumentation systems we have used over the years.

Our immediate issues with B3 product literature are:

- The recommended gauge placement behind the neck attached to the helmet's straps is not an efficient position to capture true exposures against the brain.
- We believe the use instructions are vague. Depending on your intended use of the system, you may not record any overpressure exposures that are important.

NOTE: I have initiated dialog with B3 staff. At this point, I have every reason to believe the product designers have honorable intentions. They relied on multiple external sources to assist with product use and placement positions of the gauges. We believe the personnel consulted do not understand the nature of overpressure behavior in urban settings from first hand experience. When I explained we discovered their recommended gauge placement for recording overpressure exposures does not meet their written goal, the response was logical, but evident there is no or limited first hand experience with detonations in urban environments. They requested my data and a suggestion for a better location to place the gauge.

Though a logical request, the answer is not that simple. This logical request identifies the major problems trapping the ability to understand the hazards associated with this skill:

- Too much information has been passed around over the years without true first hand knowledge or understanding of the material. Dangerous and incorrect guidance information still dominates the international tactical breaching and render safe communities because of the lack of first hand experience.

- Our collected data is not as useful as one may speculate without first hand experience working with the entire “hazard puzzle” created by urban detonations.
- Practitioners of tactical explosive breaching with first hand experience working the “hazard puzzle” already know they do not need any form of instrumentation anywhere on their body. They already know the appropriate safe positioning process by applying the hazard assessment of the environment the selected charge will be detonated. They know the safe positioning process is not determined by calculated answers from mathematical equations or computer program models designed for other explosive discipline purposes. They have an understanding of the hazards to crisis location occupants that will be created by the selected charge and surrounding environment. More importantly, these practitioners also know how to identify when a charge is not safe to detonate within the presented environment.

This evaluation process is not possible without first hand experience in the urban environment.

I requested the B3 representative to please define exactly what scenarios are they trying to record? Is it exposures to IED detonations, tactical explosive breaching, render safe, all of these, some of these, others? The reason this is important is because their user instructions are vague and depending on your intended use, you may not record the expected data.

We will continue dialog with the B3 staff personnel as they express interest.

As we move forward into this new year, here is a review of information we have confirmed from decades of testing and study for this network to use and continue driving forward:

- As presented in the 2009 LLNL paper and our recorded data inside the helmet, any educator stating you must stage ridiculously close to a tactical explosive breaching detonation because “to get in faster you have to suck it up and take the hit” does not understand what they are saying. This includes Tier One special operations personnel with “thousands” of operational breaches. What they are not telling you is how many teammates have been diagnosed with TBI because they do not realize their responsibility with creating these injuries. Interviews with operational survivors from these experiences have all stated: had they been taught how to evaluate the entire “hazard puzzle” they would not have been positioned as directed to receive the repetitive, excessive overpressure strikes.

Do not ever hesitate to question these “experts” expressing this dangerous practice: “WHY?”

- Our recent tests of overpressure recordings have a distinct pattern. Pressure measured inside the helmet is greater than that of any other gauge placement on the body. Depending on how you are taught to stage entry personnel, the brain may be exposed to damaging overpressure as the 2009 LLNL paper indicates.

- There is no “quick reference” or “easy way” to understand the complexities of the entire “hazard puzzle” created by detonations in urban environments. This is not a lazy person’s duty assignment.
- Be cautious of any person educated and trained with other explosive application disciplines trying to provide safety guidance. All other applications of explosives have safety guidance models to remove all personnel from the location of explosive use. Only tactical explosive breaching requires mission essential personnel to stage close to the detonation point with no control of the crisis location occupants at the moment of detonation. Their computer models, programs and equations are not designed for mission essential personnel safety. It is wonderful professionals wish to help, but unless they have first hand experiences with their bodies validating their “something is better than nothing” guidance, how do you know it is better than nothing?
- You own all liability for the results of the detonation. The successful prosecution of the suspects, property damage and casualties belong to the breachers and their agency, not a product manufacturer, supplier or educator that does not have first hand experiences with the entire “hazard puzzle” created in urban environments.

Only you can determine if any source of information not design for tactical explosive breaching can be used.

In conclusion, our recorded data significantly validates the need for tactical explosive breachers to work in urban environments and learn first hand how to determine whether an explosive breach is safe to conduct by understanding the “hazard puzzle” and how to evaluate safety for mission essential personnel and property damage assessments.

We have identified the next sequence of tests to continue collecting recordings.

- Conduct a series of identical tests to further evaluate the pattern with the increased overpressure exposures against the brain compared to the other recommended positions on the body.
- To validate our procedure concept to reduce amplified overpressure exposures inside the helmet with recordings compared to the current data.

The moment we feel we validated useful information, we’ll present our findings and action items for your consideration.

I welcome all questions and discussions. It is best to contact me by email. All inquiries will be answered as quickly as possible.

Hugs and RPG7s,

Chuck

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